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February 3, 2023

Ann E. Misback
Secretary
Board of Governors of the Federal Reserve System
20th Street and Constitution Avenue NW
Washington, DC 20551

Docket No. OP-1793

Ms. Misback,

Thank you for the opportunity to comment on the Federal Reserve's draft principles for climate-related financial risk management for large financial institutions. We commend the Board of Governors of the Federal Reserve System (Board) – and the Biden Administration more broadly – for taking proactive steps to assess climate-related financial risks, and for engaging with finance industry participants as you consider this rulemaking.

CoreLogic is both the gold standard for property data in the U.S. financial system and the current industry leader in climate-related physical risk assessment.

We provide real estate professionals, financial institutions, insurance carriers, government agencies, and other housing market participants with reliable, property-level data, analytics, and platforms that deliver the most qualified, comprehensive information available. Additionally, our Climate Risk Analytics provide a comprehensive view of physical risk that combines our hyperlocal property data with financial information to estimate and mitigate the impact and cost of future disasters. Merging our extensive technological capabilities with cutting-edge data science and the most accurate peril modeling techniques available today allows us to provide solutions that help government agencies and enterprises measure, model, and mitigate the physical risks of climate change at a property-by-property level.

Our wealth of property data, analytical capabilities, and connectivity throughout the financial ecosystem places CoreLogic in the best position to holistically evaluate the physical risks of climate change and the potential impacts to our economy.

The following pages outline our thoughts on the proposed draft principles and provide recommendations for how the Board can best identify, assess, and manage climate-related physical risks affecting large financial institutions. Our team of scientists, economists, and public policy experts would welcome the opportunity to further engage with Board staff on the information contained in this response. We look forward to continued conversations with the Board as we all work collaboratively to protect our financial system from climate-related risks.

Sincerely,

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BACKGROUND

Climate change introduces two main facets of risk to a bank:

1. Physical risk to the properties servicing as collateral to their loans, due to climate shifts such as rising sea levels and changing weather patterns and volatility.
2. Transition risk causing a loss of value of the investments in sectors (such as Oil, Gas and Coal) in which large banks are invested.

At CoreLogic, we concentrate our focus on the first of these two facets – **physical risk** – for which we provide a unique understanding of the specific data sets and analytical capabilities needed to both measure and assess overall climate-related financial risk across sectors. Through our risk modeling capabilities, we can provide inimitably accurate reconstruction cost values (RCV), average annual loss (AAL) estimates, and probable maximum loss (PML) calculations, all of which factor into composite natural hazard risk scores that allow us to understand the relative risk profiles for physical structures across the United States.

We then utilize innovative models that assess the effects of a given property's composite natural hazard risk score on the performance of the corresponding mortgage loan for which the property serves as collateral, including the loan's probability of delinquency, default, and economic loss severity. These combined, unique capabilities provide financial entities with the comprehensive knowledge needed to assess their full range of climate-related physical financial risks.

While the effects of natural hazard risk to mortgage loan performance is perhaps the most notable financial risk application, these modeling techniques can be applied to any financial instrument that is directly or indirectly influenced by the value of property. For example, the natural hazard profile of properties in a given metropolitan statistical area (MSA) can influence delinquency and default risk for certain municipal bonds.

As the Federal Reserve's intent is to provide guidance to large financial institutions to better mitigate the potential impacts of climate change on the safety and soundness of the financial system in the United States, CoreLogic's suggested approach will be key to evaluate the impact of physical risks and how they may affect losses at the loan-level under various potential scenarios.

Question 1: In what ways, if any, could the draft principles be revised to better address challenges a financial institution may face in managing climate-related financial risks?

From a physical risk perspective, there are three fundamental challenges that financial institutions face: data acquisition, data integration, and data 'intelligence'. It is critically important for an institution to overcome all three of these challenges in order to develop an accurate understanding of its overall climate-related financial risk.

DATA ACQUISITION

The majority of financial institutions do not currently have the climate-related physical risk information necessary to undertake an assessment of their overall physical risk exposure.

To do so would require them to develop hazard risk models across the entire spectrum of natural hazards that could potentially affect a property/asset, calculate composite hazard risk scores at an individual property/structure/asset level, aggregate those risk scores up to the portfolio level, and assess the financial implications of these added risk layers to gain a comprehensive understanding of the physical effects of climate change on their books of business. For most institutions, this is not economically feasible.

In order to accurately assess these risks – and to minimize costs – financial institutions will need to work with third-party service providers to obtain the data, metrics, tools, and models necessary to establish a baseline of physical risk across their portfolios. (For a complete step-by-step breakdown of how CoreLogic establishes a physical risk baseline, please see Appendix A.)

As a first step, these institutions will need to ensure they are using **accurate, proven models** that meet the Federal Reserve's expectations for climate-related financial risk assessment.

Thankfully, evaluating model accuracy does not need to be a labor intensive, time consuming effort. Using catastrophe models that are already certified and/or recognized by state agencies and commissions is a strong indicator of model accuracy, sound modeling methodology, and trustworthiness. For example, CoreLogic produces a North Atlantic Hurricane Model that is certified by the Florida Commission on Hurricane Loss Projection Methodology. The California Earthquake Authority (CEA) is another example of an organization that performs robust hazard model examinations for earthquake insurance sold in the state. All of our models build on state-of-the-art science, real-world experience data, engineering insights, and CoreLogic's extensive property characteristic datasets to support the measurement and management of property-level physical risk. Ensuring that the latest scientific understanding of natural hazards and climate modeling are being utilized will be critical in determining total risk exposure.

Second, financial institutions will need to ensure that their climate-related physical risk assessments rely upon data that is a **granular and accurate** representation of the risk.

In order to develop a complete understanding of risk, this data needs to be identified, ingested, and analyzed at the individual property level. This identification requires geospatial/location data that can reliably assess the geographical boundaries of a property and its structure(s), along with rich data describing the attributes of the property's parcel/land and the structure itself, such as First Floor Height (FFH) Elevation above both ground level and sea level. It also requires use of reliable technology innovations: most notably Light Detection and Ranging (LIDAR) technology, which employs an approach called Digital Elevation Monitoring (DEM) – the remote sensing technique used to identify the 3-D footprint of the structure(s), its ground elevation, and height above sea level – as well as the structure's first floor height relative to the ground elevation and sea level, including the number of feet/inches above ground or below ground relative to industry standard "safety" benchmarks. The key to reliability is use of 1-meter resolution DEM, the level of granularity necessary to permit reliable assessment of FFH elevation and related footprint data in any municipality that has relatively large population centers, including exurbs, suburbs, and urban core. Using anything less – such as 10-meter or 30-meter resolution DEM – in densely populated areas will not provide reliably accurate

assessments for individual households. (For further insights on achieving individual property/structure-Level granularity, please see Appendix A.)

It is imperative that financial institutions – and the Federal Reserve through its oversight actions – put data quality, consistency, and granularity at the forefront of any climate-related financial risk discussions. We applaud the Federal Reserve Board for including the '*Data, Risk Measurement, and Reporting*' section within the proposed guidance that specifically addresses the "availability of timely, accurate, consistent, complete, and relevant data." However, the guidance could go further in detailing the need for that data to be as granular as possible, as well as the need for data/models to be externally verified by standards setting organizations.

Recommendation: The Federal Reserve Board's guidance on '*Data, Risk Measurement, and Reporting*' should be updated in the first sentence to include 'granular' in its description of climate-risk data.

Recommendation: The Federal Reserve Board should update the proposed general principles to address the role of third-party service providers in identifying and assessing climate-related financial risk for large financial institutions.

Recommendation: The Federal Reserve Board's guidance should reflect the importance of using climate risk models that have been externally verified by standard setting organizations such as the Task Force on Climate-Related Financial Disclosures (TCFD), the Intergovernmental Panel on Climate Change (IPCC), the Carbon Disclosure Project (CDP), or the Science-Based Targets Initiative (SBTi), among others. State-level organizations such as the California Earthquake Authority (CEA) and the Florida Commission on Hurricane Loss Projection Methodology should also be included as standard setting organizations, especially considering many financial institutions may have portfolios with specific geographic footprints.

DATA INTEGRATION

Once financial institutions have acquired the necessary climate risk data, they will still need to be able to ingest it and overlay it with their own internal financial information before they can begin to conduct their climate-related financial risk analyses.

Most institutions are still in the early stages of understanding and quantifying their climate-related financial risks; they simply do not have the in-house expertise or capabilities to combine this information without risking the **integrity** of the underlying data; to do so would require them to establish a number of new internal systems/structures that would greatly increase the costs for them to comply with the proposed general principles. As mentioned in the proposed principles, this information will need to be incorporated "across all business lines and operations, including material third-party operations, and considering climate-related impacts on business continuity and the evolving legal and regulatory landscape."[1] This will prove to be a heavy lift for many financial institutions, especially during their first few years adapting to this guidance.

However, as mentioned further below in the *Data Intelligence* section, CoreLogic is already providing certain mortgage investors with composite natural hazard scores and related data, analytics, models, software tools, and expertise to evaluate how their sub-servicers are distributing natural hazard risk (i.e., current physical risk) across the portfolio of mortgage servicing rights (MSRs) for which they are responsible. These insights are crucial for large financial institutions, allowing them to work with their sub-servicers to rebalance the MSR books under their respective purviews.

CoreLogic is uniquely able to provide these insights because we have spent years developing our CoreLogic Integrated Property numbers, referred to as CLIP numbers. Every property in our national ecosystem is assigned a CLIP number that links all instances of that property across our data sets. By linking records, CLIP delivers a more accurate view of

any property, even ones that have yet to enter tax-roll records. CLIP's data connectivity creates, enriches, and enhances property data aggregation, delivering more high-quality and useful details than any single data set. It eliminates inaccurate data by reconciling inconsistencies across multiple property data records, helping to avoid modeling gaffes, redundancies, and errors by providing persistent, stable, and unique data for each property. CLIP is even programmed to recognize different terminology to describe the same property across multiple data sets.

Figure 1 – Visual Depiction of CoreLogic Integrated Property (CLIP) Number

Using a property identifier such as CLIP means that decisions will always be based on accurate, comprehensive, and persistent information – **establishing a single source of truth for a property**. By bridging public records gaps and providing a full view of a property's lineage, it eliminates any worries about inconsistent or outdated data, which is crucial for companies and government agencies that require completely reliable information on properties. For both, ensuring that the identifiers describing the properties are correctly linked to the data sources is key to understanding who's most vulnerable to natural hazards.

With CLIP, we can gain detailed clarity on the impacts of climate-related financial risk from an individual property level up to a portfolio analysis level by integrating multiple, previously disconnected data sets, including granular hazard risk information. The Federal Reserve can analyze systemic risk to our financial system by using a resource such as CLIP to expand their property datasets to include macroeconomic trends, hazard risk, and other data sets.

Recommendation: The Board should hold a series of technical workshops to help financial institutions better understand the practical aspects of integrating climate-related hazard risk data into their current books of business. The Board should bring in academics, think tanks, and data providers as presenters/speakers for these workshops.

DATA INTELLIGENCE

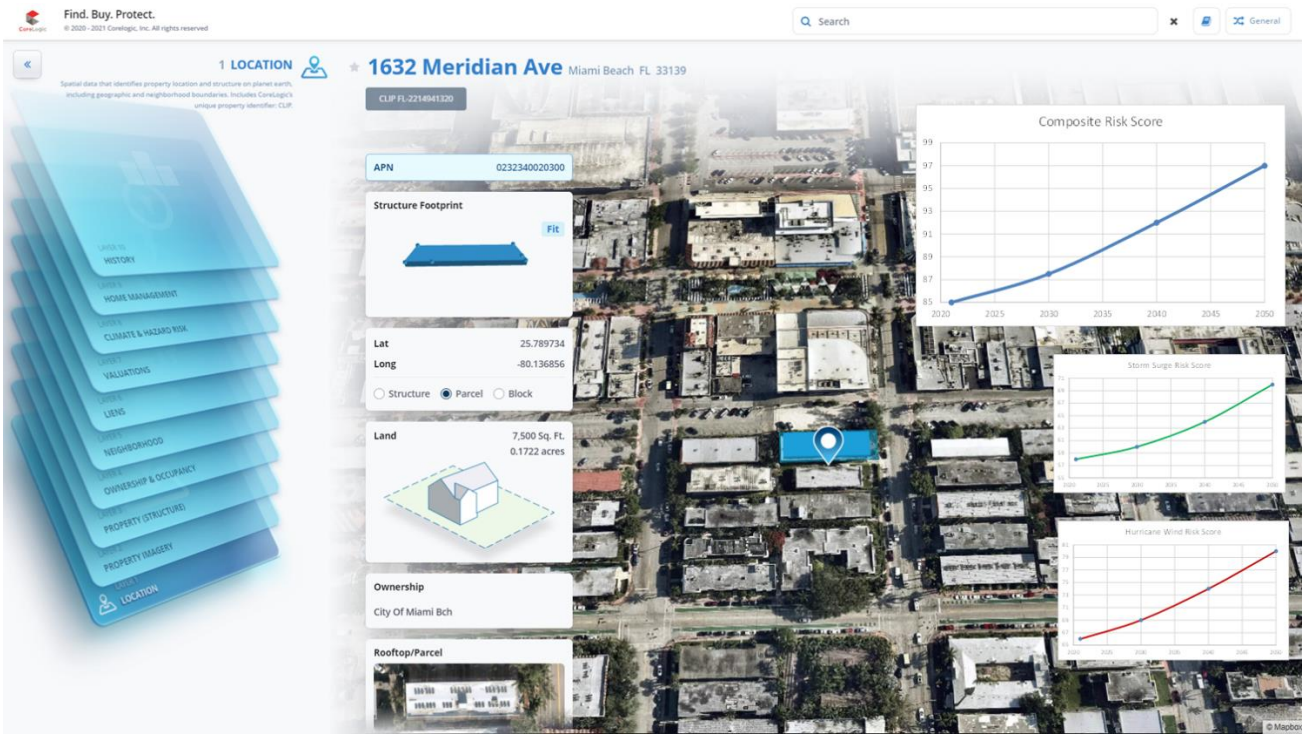
Finally, after acquiring and integrating the necessary climate risk data, it will be possible to extract a range of useful outputs that will help both the financial institutions themselves and the Federal Reserve identify and address a range of potential risks.

However, this will prove a difficult task for many institutions, especially during the first few years of compliance when having to make these assessments and disclosures for the first time. Thankfully, third party providers such as CoreLogic have the expertise to help financial institutions glean insights from the property-level to portfolio-level.

Individual Property Insights

The end goal of this exercise should be to produce a property/structure-level composite hazard risk score for each property serving as collateral for a mortgage loan held in an institution's portfolio. These insights to a specific property will allow financial institutions to **quantify and comprehend climate change at an individual household level**. This, in turn, permits them to assess climate risks across their entire loan portfolio, providing the institution with critical insights regarding risks of uninsured losses, mortgage loan delinquency and default, and ultimately loss severity, including impacts to capital reserves. These adjustments will go a long way toward helping financial institutions assess their overall resiliency to the impacts of climate change. It will also provide the Federal Reserve with further confidence that the entities it oversees are capable of withstanding these future impacts.

Figure 2 – Example of Climate-Related Composite Risk Analysis at the Individual Property-Level

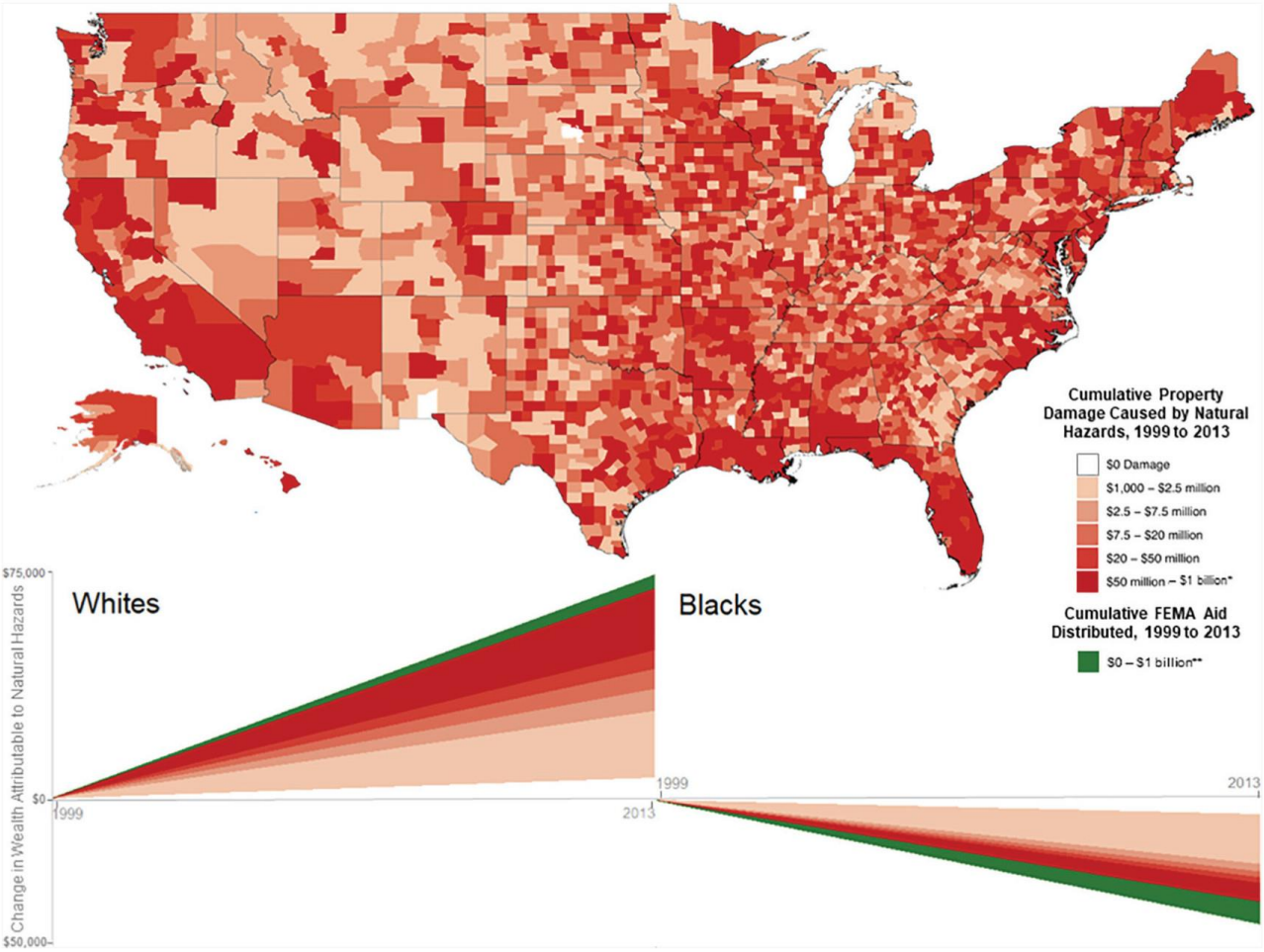


Community-Level Insights

Financial institutions can extrapolate even more actionable information when aggregating these assessments at a local community level.

One of the more notable acts during the first year of the Biden Administration was the issuance of Executive Order 14008 (Tackling the Climate Crisis at Home and Abroad), which launched the Justice40 Initiative "with the goal of delivering 40 percent of the overall benefits of relevant federal investments to disadvantaged communities" and established an Environmental Justice Scorecard to track progress toward achieving that goal.[2] This is a crucial step in ensuring that both equality and equity are enshrined in all aspects of our economy, especially as we work to address the future impacts of climate change. Moving forward, the mortgage and banking industries will play a crucial role in assessing, quantifying, and mitigating these impacts on low-to-moderate income (LMI) communities and communities of color.

Figure 3 – Cumulative Property Damage from Natural Hazards and its Effects on Racial Wealth Gaps in the U.S., 1999-2013



Source: As Disaster Costs Rise, So Does Inequality[3]

As Figure 3 above indicates, communities of color are disproportionately affected by natural hazards, both in terms of total property damage and ability to accumulate wealth following a disaster, which are tightly coupled issues. CoreLogic's expertise in physical risk data & analytics allows us to focus on the former (providing risk assessments to inform mitigation strategies that lead to decreased property damage amounts) in order to help relieve the latter (understanding that post-disaster wealth accumulation is easier when property damage is minimal).

When property/structure-level composite hazard risk assessments – and forward-looking climate scenarios – are overlayed with additional, publicly available demographic data (such as the maps of Atlanta in Figure 4 and Figure 5 below) and broken down by core-based statistical areas (CBSAs) with LMI and majority-black CBSAs highlighted in red, respectively, we can easily assess the impacts of climate change on LMI communities and communities of color.

Figure 4 – LMI CBSAs in Atlanta Metro Area

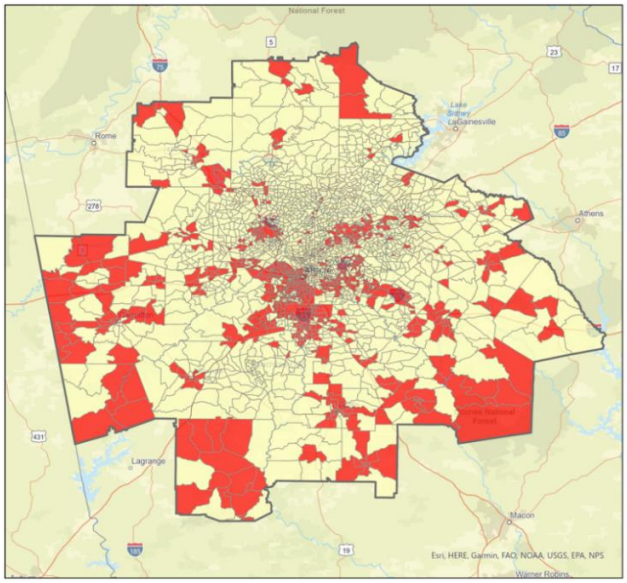
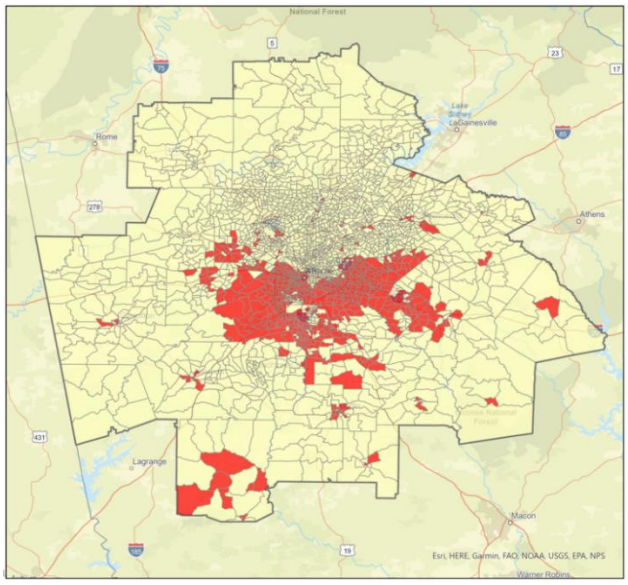


Figure 5 – Majority-Black CBSAs in Atlanta Metro Area



Financial institutions can use this information to assess their risk mitigation measures to see if they are disproportionately affecting these communities and adapt accordingly. They can conduct this analysis beginning at an individual property level and aggregate those into a variety of larger geographic boundary areas such as CBSA, zip code, school district, tax district, and many more.

These assessments can also be conducted at the LMI and Minority Census Tract levels to accommodate a range of compliance requirements, including the Community Reinvestment Act (CRA), fair lending requirements, as well as the Duty-to-Serve obligations, Affordable Housing Goals, and Equitable Housing Finance Plans of Fannie Mae and Freddie Mac. (For more on CoreLogic's thoughts on these goals, see our response to the recent Federal Housing Finance Agency (FHFA) RFI on the agencies' equity plans.)

Financial institutions will be able to identify and subsequently address any potential inequities in their lending programs, if applicable, and take proactive steps to ensure that LMI communities and communities of color are not disproportionately affected by the future impacts of climate change.

Portfolio-Level Analysis

Some banks, mortgage servicers, and capital markets investors are actually already assessing how climate change has altered the physical risk profile to properties servicing as collateral to their mortgage loans and Mortgage Servicing Rights (MSRs). Due to the current absence of new regulatory requirements, these entities are approaching climate-related financial risks in a manner aligned with their existing risk management practices.

However, even the more proactive banks are still in the early stages – they are looking to understand and quantify their climate risks, and CoreLogic is presently assisting them with the tools and techniques that we've described throughout this response.

The figure below provides an example of merely one way mortgage investors are utilizing our composite natural hazard scores and related data, analytics, models, and software tools. In this example, a large commercial bank has engaged ten "sub-servicers" who provide performing and non-performing mortgage servicing activities on the commercial bank's behalf. For the first time, the commercial bank wanted to evaluate how their sub-servicers were distributing natural hazard risk (i.e., current physical risk) across the portfolio of MSRs they were responsible for. As noted in Figure 6, six of the sub-servicers were deemed to have too heavy a concentration of natural hazard risk in the MSR book they are responsible for servicing, while three servicers had a moderate concentration risk profile, and only one that was deemed to have an adequate concentration risk profile. This insight was crucial to the commercial banks, who subsequently worked with their sub-servicers to rebalance their respective MSR books under their respective purviews so that each of them achieved a "green" (i.e., adequate concentration risk) rating.

Figure 6 – Percentage of Loans in Servicer Portfolios by Composite Risk Score

	Hurricane wind change from 50 yr to 100 year PML	**Coastal Surge** change from 50 yr to 100 year PML	**Wildfire** change from 50 yr to 100 year PML	**Severe Convective Storm** change from 50 to 100 year PML
min	0.012%	0.019%	0.008%	0.038%
max	20.707%	23.611%	24.38%	21.732%
average	1.850%	2.940%	3.313%	3.441%
median	1.432%	2.481%	2.905%	3.128%
	12,046 of the 121,164 locations have the 50-100 year PML difference greater than 10%	**20,116** of the 121,164 locations have a 50 to 100 year PML difference greater than 10%	**26,480** of the 121,164 locations have a 50 to 100 year PML difference greater than 10%	**27,326** of the 121,164 locations have a 50 to 100 year PML difference greater than 10%

By Servicer or Portfolio | By Peril

Composite Risk Score	Servicer "A"	Servicer "B"	Servicer "C"	Servicer "D"	Servicer "E"	Servicer "F"	Servicer "G"	Servicer "H"	Servicer "I"	Servicer "J"	Grand Total
1-10	16.4%	14.2%	25.3%	29.8%	12.7%	11.6%	17.4%	8.1%	8.2%	11.3%	13.1%
11-20	30.5%	14.3%	18.5%	26.9%	16.8%	14.2%	6.1%	9.4%	11.6%	17.1%	16.9%
21-30	7.6%	15.5%	8.4%	10.0%	13.9%	13.9%	16.8%	20.0%	11.3%	11.1%	13.6%
31-40	10.4%	12.5%	7.2%	8.9%	12.9%	11.2%	8.2%	6.9%	10.4%	12.2%	12.5%
41-50	9.2%	14.1%	7.9%	7.0%	12.7%	11.1%	8.8%	15.0%	12.2%	11.2%	12.5%
51-60	7.6%	7.4%	6.3%	4.6%	8.1%	8.7%	6.7%	8.8%	10.4%	8.9%	8.1%
61-70	4.8%	5.1%	7.2%	4.5%	5.7%	6.7%	9.8%	8.1%	7.9%	6.8%	5.7%
71-80	6.2%	7.0%	5.6%	4.0%	7.3%	8.5%	10.4%	8.1%	12.7%	9.2%	7.4%
81-90	4.5%	6.4%	7.7%	3.2%	6.2%	9.1%	12.5%	8.8%	9.1%	7.7%	6.4%
91-100	2.9%	3.5%	5.8%	1.2%	3.6%	4.9%	3.4%	6.9%	6.5%	4.5%	3.7%
81-100	7.40%	9.95%	13.51%	4.35%	9.83%	14.01%	15.85%	15.63%	15.55%	12.22%	10.11%
total	4,168	5,337	7,192	3,178	**83,544**	3,083	3,328	2,160	3,003	6,171	121,164

By Servicer or Portfolio | By Peril

Moreover, once the commercial bank was able to establish the current physical risk baseline to the MSRs across their book of business, as well as across the sub-servicers servicing those MSRs, the commercial bank could apply future climate scenarios, using CoreLogic catastrophe modeling techniques, to assess how many of the properties serving as collateral to the mortgage loans in the MSR book of business are at risk of having Probable Maximum Loss (PML) exceeding 10% from the next 50 to 100 years as a result of future climate change scenarios.

Recommendation: The Board should hold a series of workshops to help financial institutions incorporate these proposed principles into their risk management frameworks in a manner consistent with safe and sound practices. The Board should bring in academics, think tanks, and data providers as presenters/speakers for these workshops.

Question 2: Are there areas where the draft principles should be more or less specific given the current data availability and understanding of climate-related financial risks? What other aspects of climate-related financial risk management, if any, should the Board consider?

As mentioned previously in our response, it is imperative that financial institutions – and the Federal Reserve through its oversight actions – put data quality, consistency, and granularity at the forefront of any climate-related financial risk discussions.

Our only additional recommendations for the Board regarding current data availability and specificity requirements include:

- Requiring the use of market-tested, industry-leading climate-related financial risk models and related data that include granular, integrated hazard risk scores that consider a wide number of potential perils, as well as average annual loss and reconstruction cost value estimates, which can be combined with property/flood insurance coverage and loan-level performance data to ascertain both collateral value and loan delinquency exposures for collateral-backed loans.

- Requiring a projection of future risk levels based on expected impacts from climate change through the use of industry leading tools that are market-tested in conjunction with data, technology, and internationally recognized climate scenarios for stress testing catastrophe models.

Regarding additional aspects of climate-related financial risk management that the Board should consider, we simply want to reiterate that the Board should prioritize a review of climate-related impacts within LMI communities. We thank the Board for including note of this in the *Strategic Planning* section of the proposed principles and hope to see the Board make it a priority moving forward.

Question 3: What challenges, if any, could financial institutions face in incorporating these draft principles into their risk management frameworks?

When incorporating these draft principles into their risk management frameworks, there are a number of challenges that larger financial institutions may face:

- *Time* – It will take time for financial institutions to fully incorporate these draft principles into their risk management frameworks, especially the sections concerning *Data, Risk Measurement, and Reporting* and *Scenario Analysis*. Institutions will need time to acquire, verify, and incorporate data into their existing frameworks, perform climate-related risk analyses, interpret the results, and feed those results back into these new risk management systems.

- *Money* – For many financial institutions, there will be additional costs to incorporating these draft principles into their risk management frameworks, especially for those who do not already have the internal capacity to identify and respond to climate-related financial risks. These companies may need to hire additional staff, re-route current resources, or re-prioritize some of their strategic planning in order to adapt to these new principles. Thankfully, as mentioned previously, third-party data providers can help reduce these costs.

- *Confidence* – As financial institutions incorporate these draft principles into their existing risk management frameworks, they will be faced with a number of choices as to which definitions, models, tools, etc. they need to use. While the Federal Reserve's draft principles go a long way toward identifying the specific risks that financial institutions need to focus on, they don't address acceptable standards for climate-related financial risk analyses. These institutions could use the additional assurance that the definitions, models, tools, etc. they are using meet the expectations of the Federal Reserve.

APPENDIX A – ESTABLISHING A BASELINE OF PHYSICAL RISK

Step 1 – Calculate Nationwide, Composite Natural Hazard Risk Scores

Physical climate risks result from high-gradient perils that can change over short distances, making them wide-reaching yet still acutely felt.

To understand these disparities, current and future risk data on numerous natural hazards – such as flood, wind, wildfire, and more – is needed for each individual structure. This is key: despite the fact that many areas in the U.S. are exposed to multiple natural hazards, the industry has historically reviewed these hazards individually. Although insightful, this does not provide an accurate risk measurement for structures that are impacted by multiple hazards. Instead, we need structure-specific, integrated hazard risk scores. The goal of an integrated hazard risk score is to represent the total hazard risk for any location across the U.S.

Because many large banks, community banks, and enterprise risk managers are already looking for a single score to reflect the combined risk of all natural hazards that affect their portfolio, CoreLogic created a high-definition Catastrophe Risk Model that combines our existing natural hazard datasets into a comprehensive single hazard score. In our experience, these such models should incorporate, at a minimum, the following hazard risks:

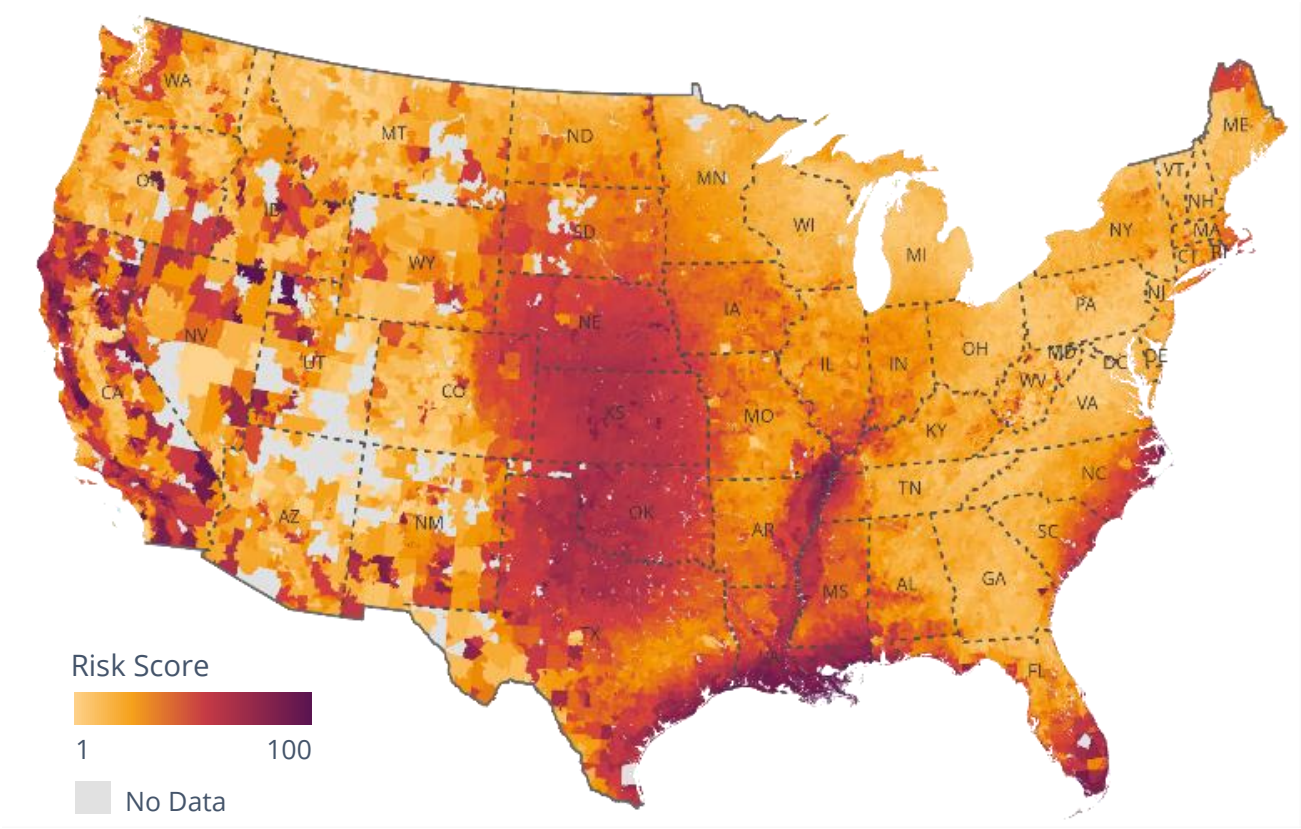
- Earthquake
- Wildfire
- Inland Flood
- Severe Convective Storm
- Tropical Storm Wind
- Winter Storm
- Hurricane/Tropical Storm Surge
- Hurricane

To create these scores, we utilized catastrophe risk modeling, conditioned with today's empirical climate characteristics, to combine the severity and frequency of damage into a composite risk score, which represents the sum of the Annual Adjusted Loss (AAL) for the seven individual hazards mentioned above for approximately 105 million residential structures across the U.S. The value of this composite AAL, relative to the calculated Reconstruction Cost Value (RCV), is used to rank all structures with a 1-100 score, where the higher scores equate to higher risks. When combined with our innovative Hazard-Effected Loan Performance (HELP) models, which correlate the property's composite natural hazard risk score to a probability of mortgage loan delinquency, default, and economic loss severity, these climate-related financial risk analytics can be used not only in property and casualty insurance markets, but also in the housing finance ecosystem (primary and secondary), by investors in residential mortgage-backed securities (RMBS), asset-backed securities (ABS), and credit risk transfers/other financial risk derivatives, and by financial services prudential regulators for supervisory stress testing and oversight, as well as by publicly traded companies preparing materiality disclosures in Securities and Exchange Commission (SEC) and Commodity Futures Trading Commission (CFTC) filings.

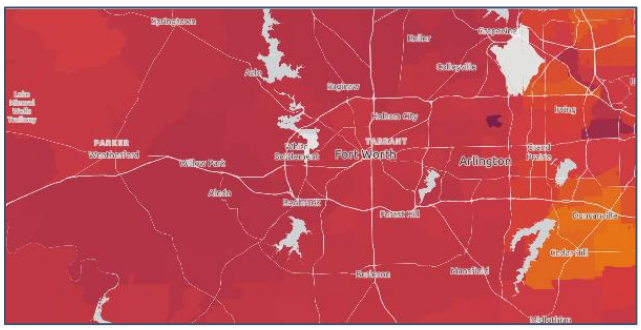
Additionally, these composite scores can be combined with geospatial visualization tools to reflect national concentrations of risk while maintaining the fidelity of high gradient local risk differentiation. For example, a composite risk map (Figure 7 on the following page) assists in easily identifying the areas with the highest risk homes.

The map below illustrates risk levels across the country, showing that the highest risk homes are in California (dominated by earthquake and wildfire); Texas, Oklahoma, Kansas, Nebraska (dominated by tornado/hail); along the Mississippi River (dominated by river flooding and earthquake risk); and large Gulf and Atlantic coastal stretches (dominated by hurricane winds and storm surge/riverine flooding).

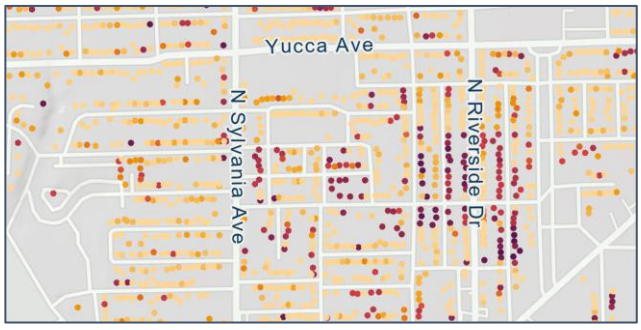
Figure 7 – CoreLogic Nationwide Composite Natural Hazard Risk Map



Tarrant County, TX



Fort Worth, TX (Property-Level Risk)



Catastrophe modeling and property risk analysis are paramount to accurately predicting the damages that could occur, down to a parcel and structure level. Financial institutions can model large-scale financial needs (i.e., ensuring adequate capital reserves) using composite risk scores and HELP models for a certain portfolio or area. With access to new catastrophe modeling and property data, financial entities are evolving in the way they protect homeownership and property, offering new financial products, securities, and derivatives and transformational experiences that better suit today's reality of risk and homeowner, consumer, and investor expectations.

With composite risk scores and modeled effects to mortgage and other loan performance available across the United States, the second step is to get as granular as possible with those assessments.

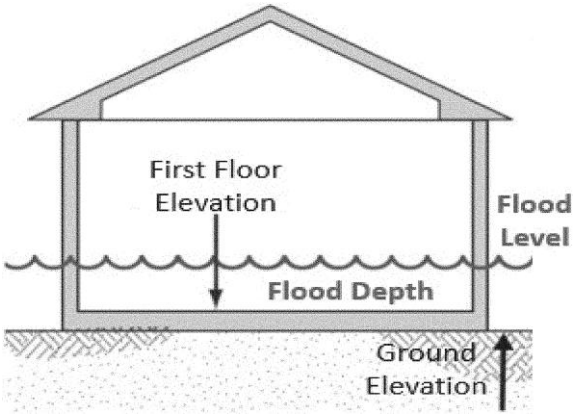
Step 2 – Achieve Individual Property / Structure-Level Granularity

There appears to be a perception within federal government that physical risk from climate change is already well understood. We respectfully suggest that various agencies look deeper into the data and analytics – at least with respect to reliable property-level physical risk assessments.

To reliably assess physical risk, one must be able to both identify the property itself and identify the specific structure(s) on that property that require separate assessments. This identification requires geospatial/location data that can reliably assess the geographical boundaries of a property and its structure(s), along with rich data describing the attributes of the property's parcel/land and the structure itself. If the underlying location data is not accurate, assessments – such as AAL calculations – will not reflect the true risk to the structure, as exemplified below in Figure 8.

Figure 8 – Variability in Average Annual Loss Calculations

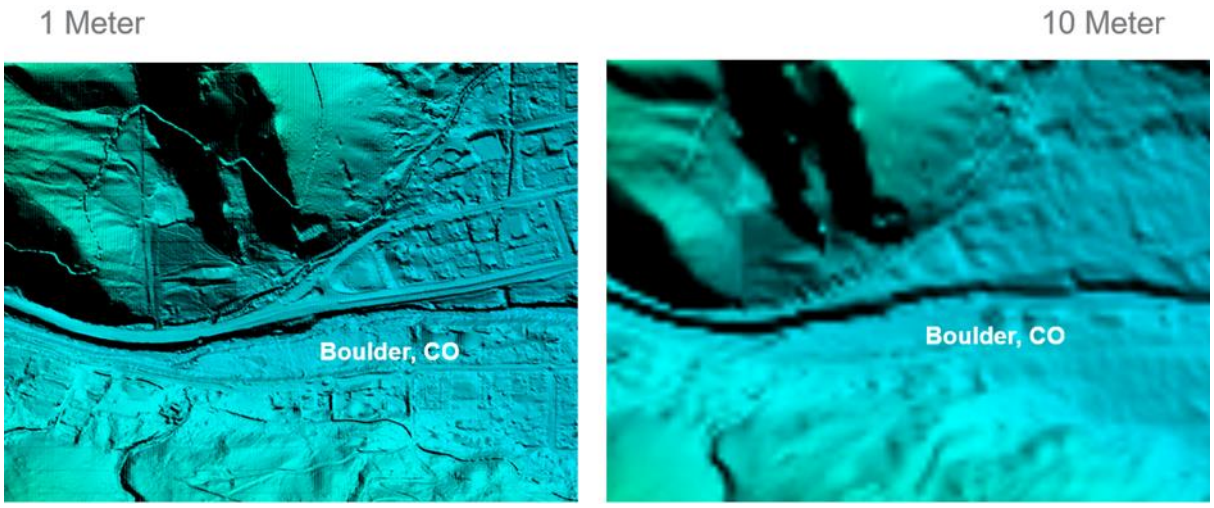
Figure 9 – First Floor Height Elevation



These reliable assessments involve the use of models that are based on underlying data inputs that reliably determine First Floor Height (FFH) Elevation (Figure 9) relative to sea level and ground level. They also require use of reliable technology innovations: most notably Light Detection and Ranging (LIDAR) technology, which employs an approach called Digital Elevation Monitoring (DEM) – the remote sensing technique used to identify the 3-D footprint of the structure(s), its ground elevation, and height above sea level – as well as the structure's first floor height relative to the ground elevation and sea level, including the number of feet/inches above ground or below ground relative to industry standard "safety" benchmarks.

The key to reliability is use of 1-meter resolution DEM, the level of granularity necessary to permit reliable assessment of FFH elevation and related footprint data in any municipality that has relatively large population centers, including exurbs, suburbs, and urban core. Using anything less – such as 10-meter or 30-meter resolution DEM – in densely populated areas will not provide reliably accurate assessments for individual households, as evidenced below in Figure 10.

Figure 10 – Comparison of 1-meter v 10-meter Digital Elevation Monitoring



The measurement of climate risk relies upon data that is a granular and accurate representation of the risk. For the Federal Reserve, and the financial institutions it regulates, a complete understanding of risk must, at a minimum, include enterprise-wide physical risk assessments. As the frequency and severity of natural hazard events increase, financial institutions face the increasing possibility that their business will be interrupted by significant, serial weather events. These risks can manifest themselves both directly and indirectly as damage to assets and disruptions to an institution's physical assets, operations, book of business, and even employee safety.

Thankfully, market-tested science & analytics can help financial institution managers, their boards of directors, and the Federal Reserve to regulate, monitor, review, and guide climate change disclosures in a consistent, comparable, and reliable way. Catastrophe risk modeling – quantifying the frequency and severity of potential natural catastrophes – has long been a tool deployed to help manage, plan for, and mitigate the risks of such events. These same tools have been adapted to study the potential catastrophic impacts of future climate change scenarios. CoreLogic is a leader in catastrophe risk modeling and offers a number of climate-based models that allow for a consistent, comparable, and reliable understanding of risk across geographies. When combined with granular and comprehensive structure data, they can provide understandable and actionable disclosure of risk across a bank's portfolio of assets.

Furthermore, these analyses can be combined with demographic data to provide us with an understanding of the often-increased levels of risk that LMI communities and communities of color face due to the increased threat of climate change.

APPENDIX B – REFERENCES

[1] Federal Reserve System. (2022, December 8). Principles for Climate-Related Financial Risk Management for Large Financial Institutions. Federal Register. Retrieved January 18, 2023, from https://www.federalregister.gov/documents/2022/12/08/2022-26648/principles-for-climate-related-financial-risk-management-for-large-financial-institutions

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[3] As Disaster Costs Rise, So Does Inequality. Howell, Junia and Elliot, James. December 04, 2018. https://doi.org/10.1177%2F2378023118816795